

Appendix B

Stoller Logging Data — Stripcharts

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Appendix B contains a complete record of subcontractor-submitted logging stripcharts for Type A Subsurface Disposal Area logging data collected between September 2003 and August 2004. Because of the heterogeneity of the buried waste and the suite of contaminants associated with a given waste stream (or mixture of waste streams), the passive gamma ray spectra acquired at any given location in the waste zones are complex. Proper identification of radionuclides is further complicated by interference issues due to similar energy gamma rays from multiple, potential radionuclides. A detailed knowledge of the composition of the waste being interrogated is required to provide correct interpretations of the gamma ray spectra.

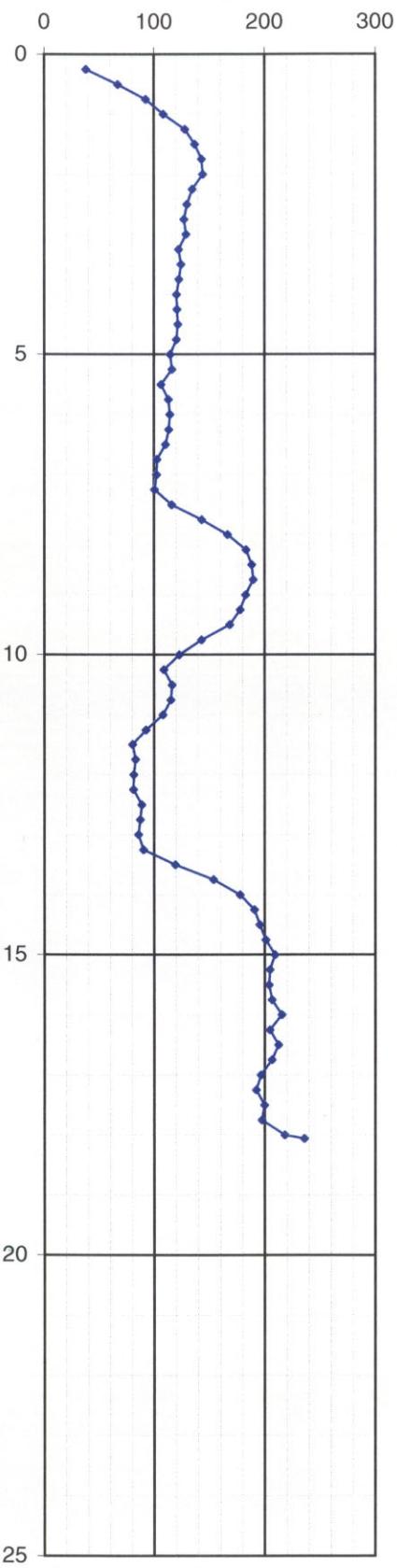
Results presented in these stripcharts represent the logging subcontractor's interpretation of the nuclear data and are, in some cases, subject to alternate interpretations. The following alternative interpretations of the passive gamma ray data are particularly noted:

1. Europium-154 was identified in numerous probeholes based on the 1,274-keV gamma ray. The presence of Eu-154 in Subsurface Disposal Area waste material is strongly questioned. Both Eu-152 and Eu-154 are formed through neutron capture reactions, by Eu-151 and Eu-152 respectively, which occur in roughly equal amounts as impurities in metal. Europium-151 has a capture cross section 10 times greater than Eu-153, and Eu-152 has a half-life of 13.48 years compared with 8.59 years for Eu-154. These properties indicate that Eu-152 should be present. Additionally, consultation with Idaho Completion Project staff, who have extensive experience in neutron activation analysis, corroborates the fact that Eu-152 and Eu-154 should be identified together and not exclusive of each other. Europium-152 has several lines that would be measurable in the presence of large activities of Co-60, Cs-137, and transuranic (TRU) material. If Eu-154 was identified, then Eu-152 would almost certainly be present as well. However, Eu-152 was not reported by the subcontractor (except in the single case discussed below).
2. The 1,274-keV gamma ray also was reported extensively by the previous Type A logging subcontractor, but was not associated with Eu-154. It was suggested by Idaho National Laboratory subject matter experts that this gamma ray is most likely due to an (α n) reaction on fluorine. It is notable that most of the Eu-154 reported in this appendix correlates closely with Am-241, which is an alpha-emitter. This calls the identification of Eu-154 into question.
3. Stripcharts for probeholes P2-PU-1 and P2-PU-2 identify Eu-152 through the 344-keV and 1,408-keV lines; however, the data are marked as suspect because an alternate source for the 344-keV line could not be identified. There is a strong argument that the 344-keV line is actually from Pu-239, and the 1,408-keV line is attributed to naturally occurring radioactive material. Taking the ratio of the branching ratios of the 344-keV line from Pu-239 to that from Eu-152, a value of 4,666.667 is obtained. If this value is then multiplied by the apparent Eu-152 concentration calculated from the 344-keV line, a value is obtained that agrees very well with the apparent concentration for Pu-239 as reported using the 375-keV and 414-keV lines. This also is supported by detailed analysis of the long-count data, demonstrating that the spectral analysis software continuously misidentified the 1,408-keV peak from Bi-214 as the 1,408-keV peak from Eu-152. Further, because of the nature of the targeted waste, it is highly unlikely that europium contamination would be associated with the plutonium-contaminated graphite waste.

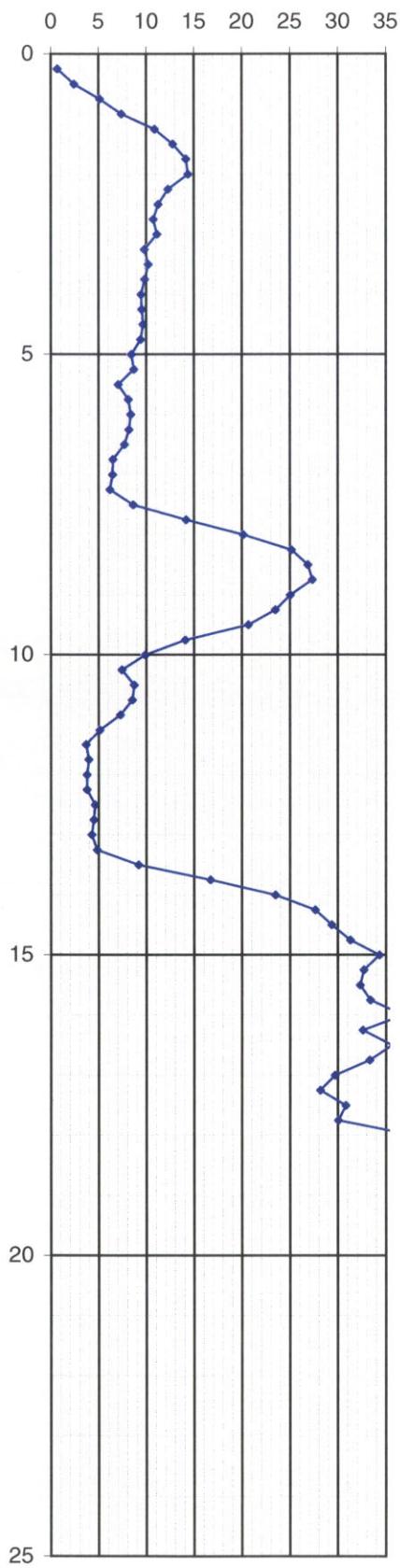
T3-EU-01

Neutron Log Response

raw cps



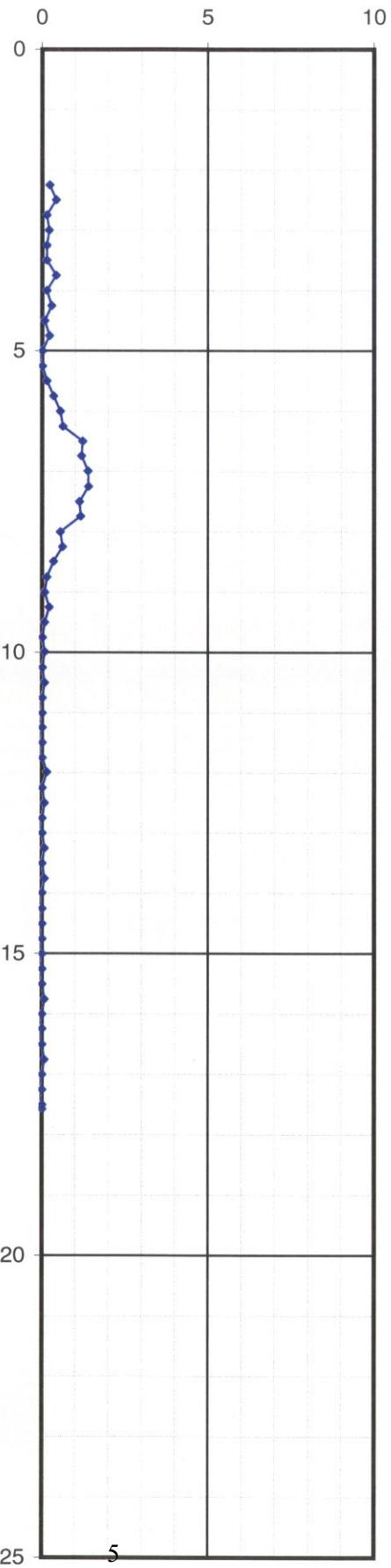
vol % moisture

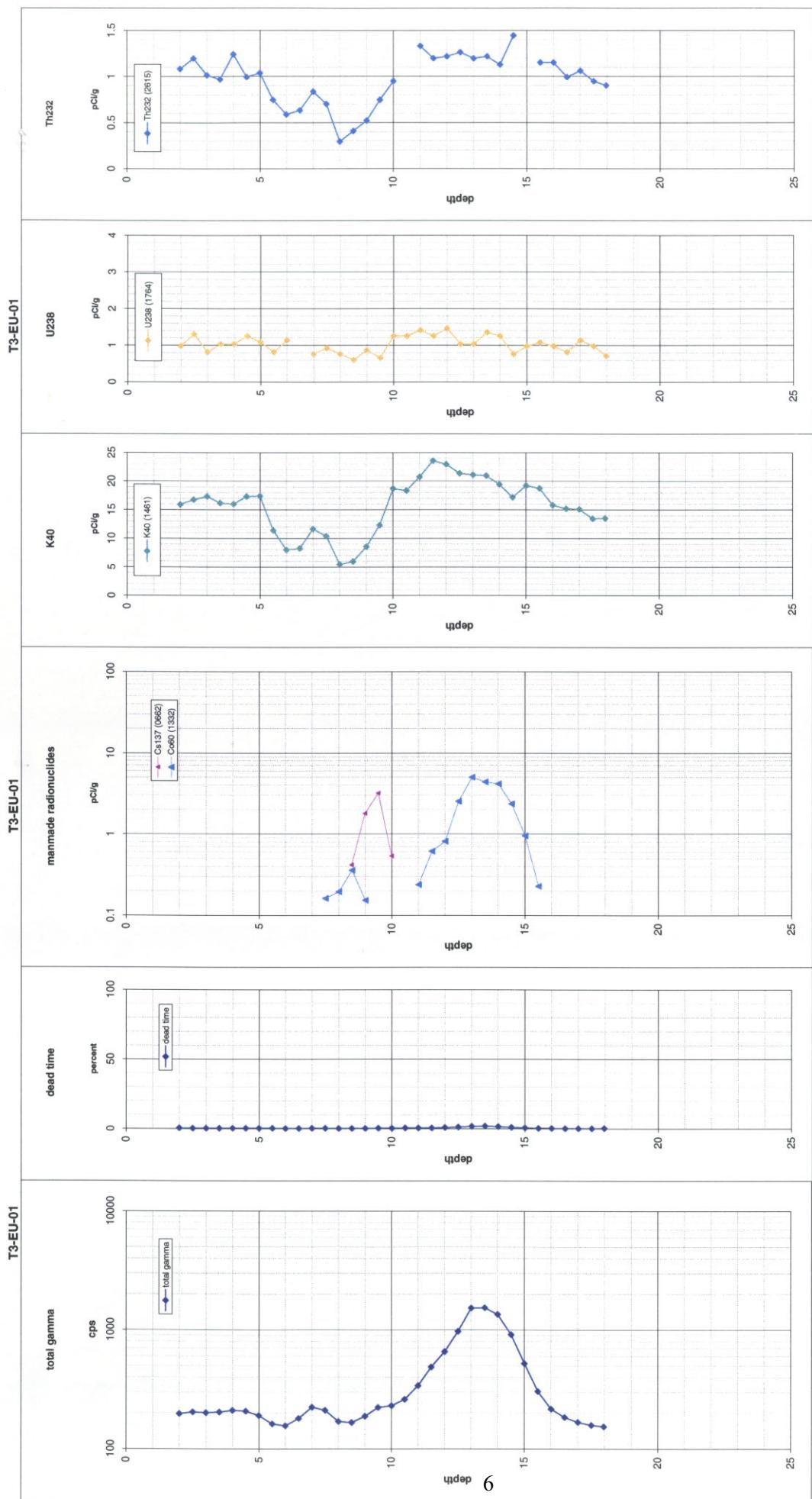


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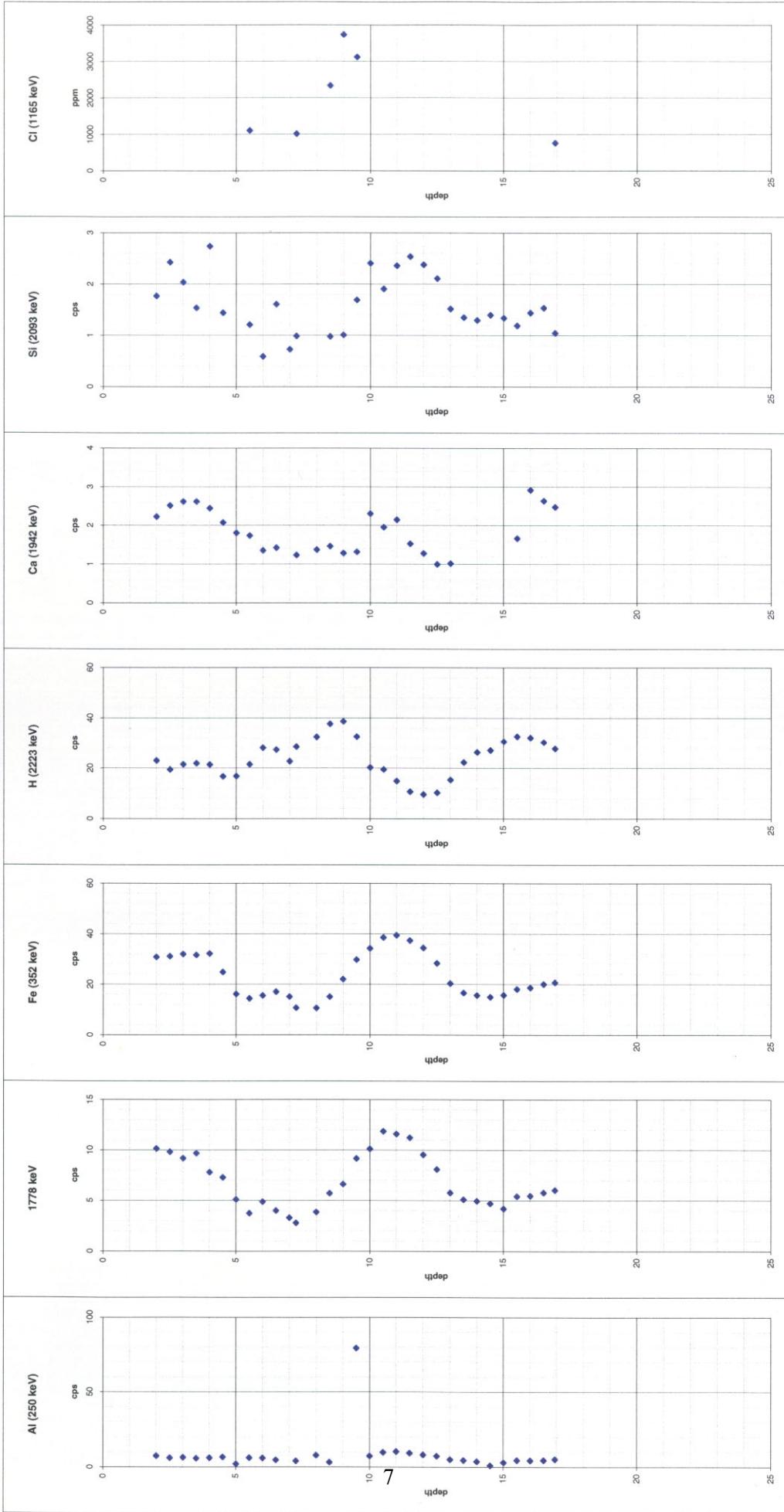
Passive Neutron Log

raw cps





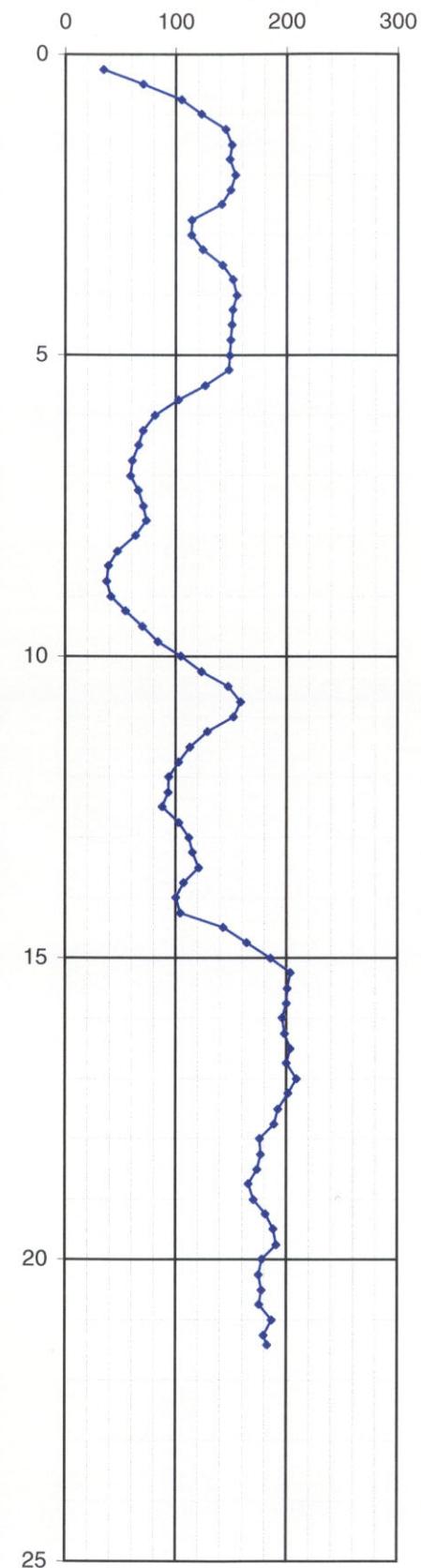
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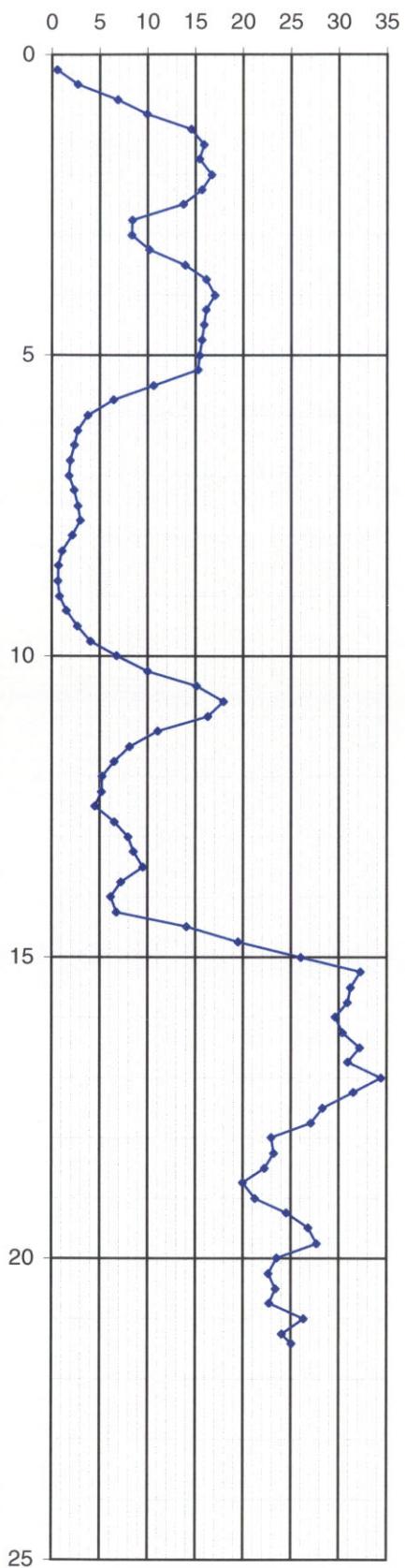
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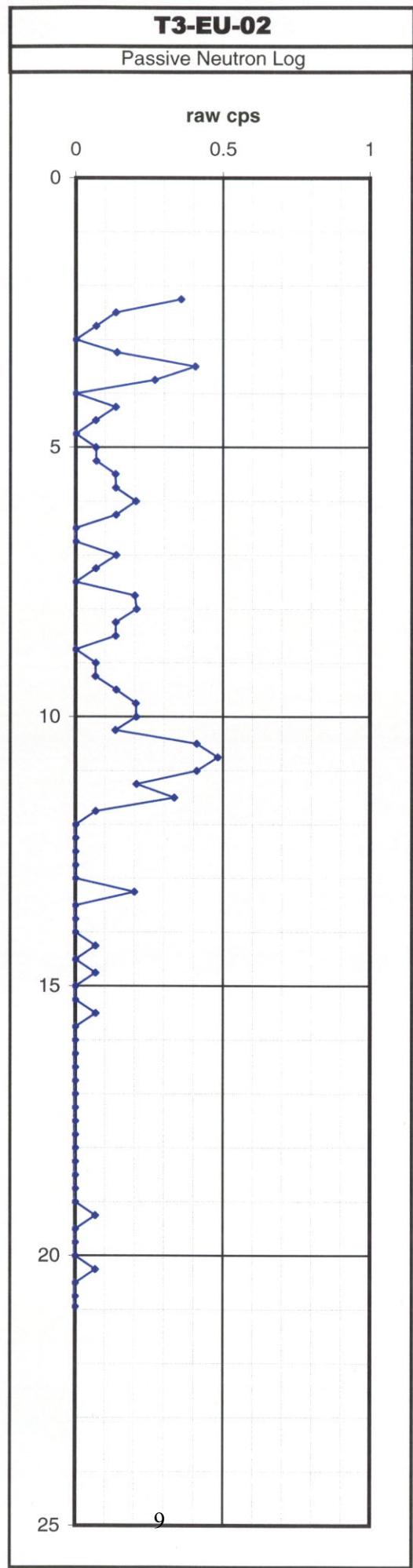
Neutron Log Response

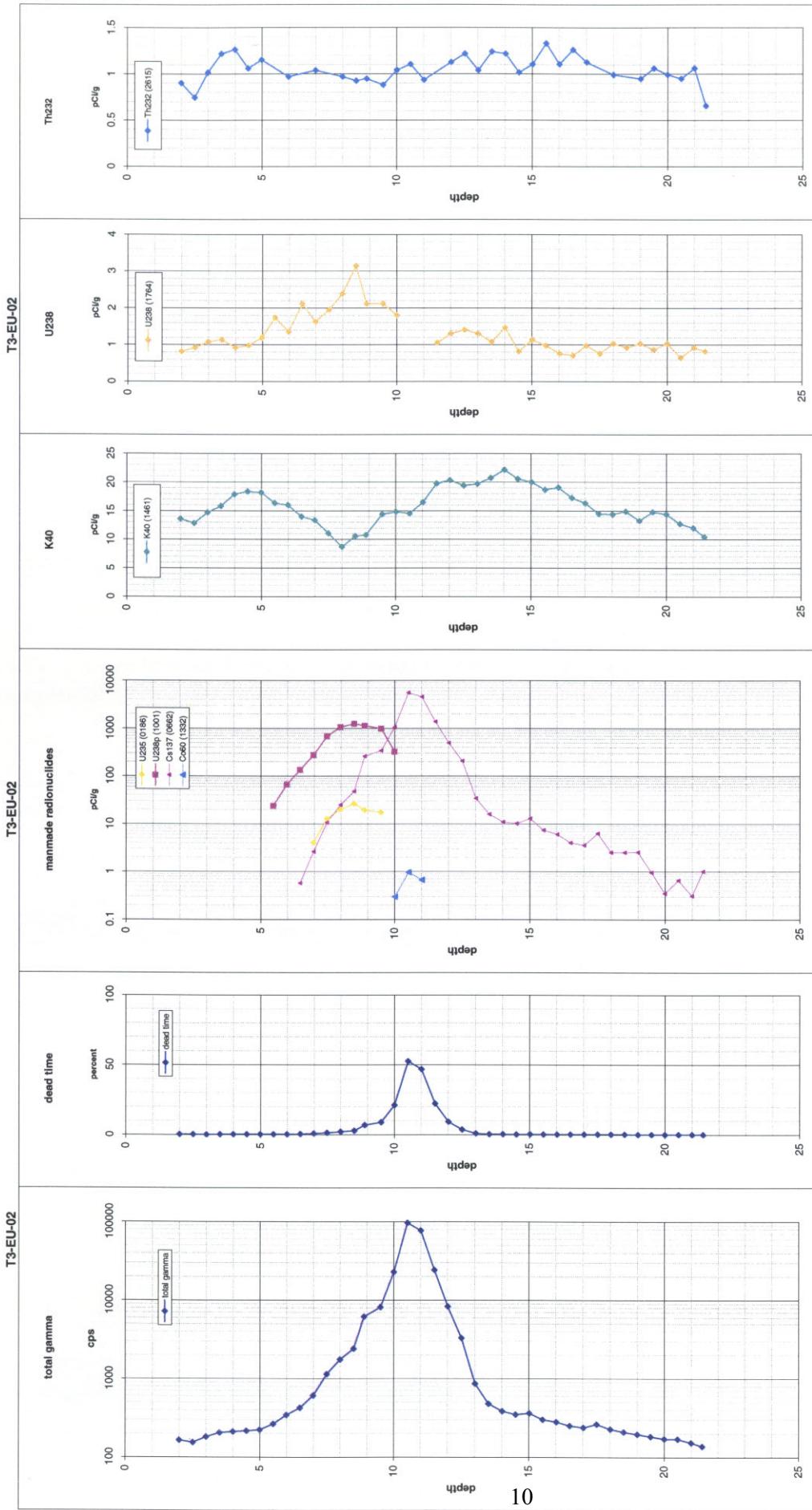
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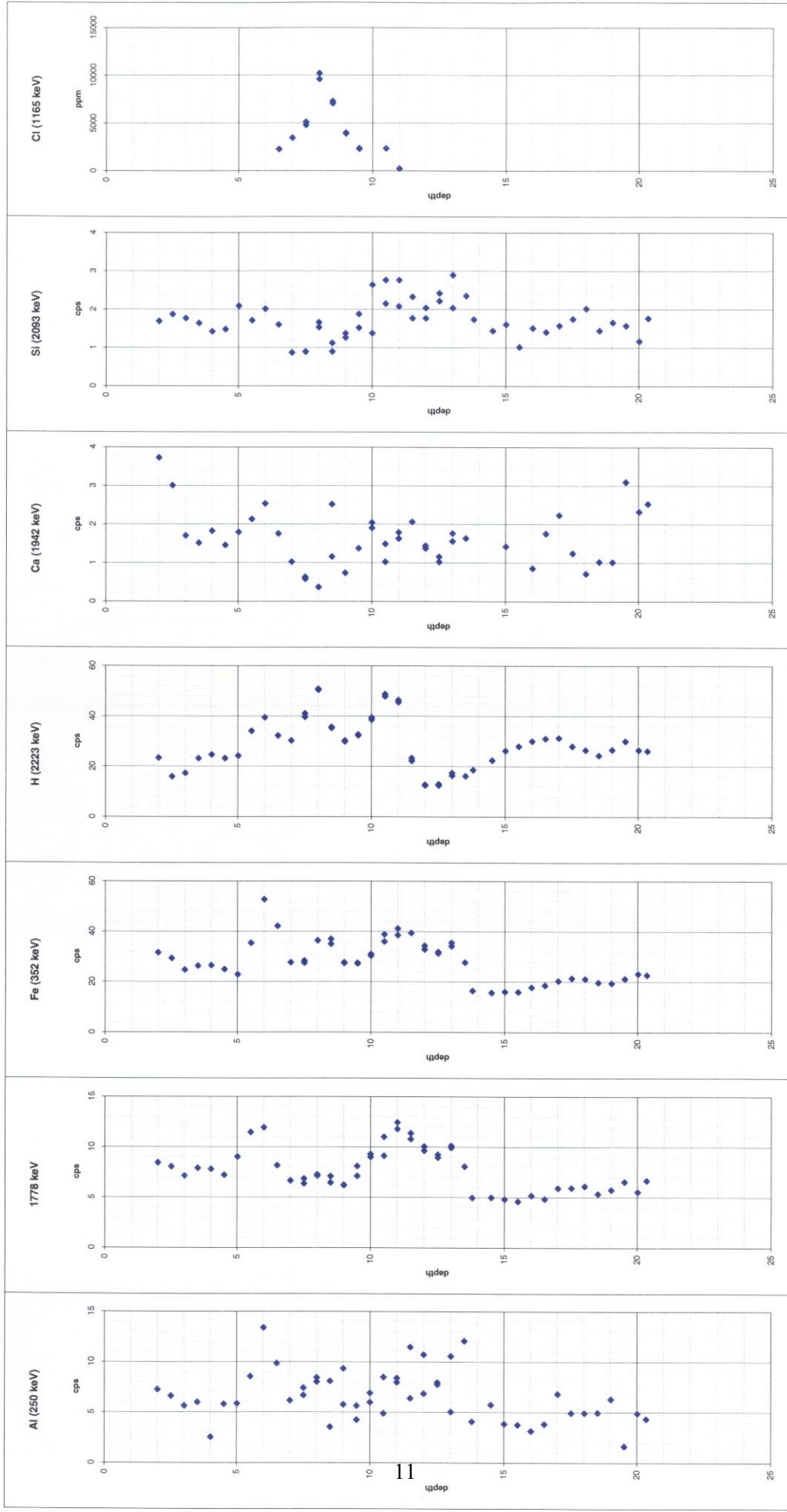
vol % moisture



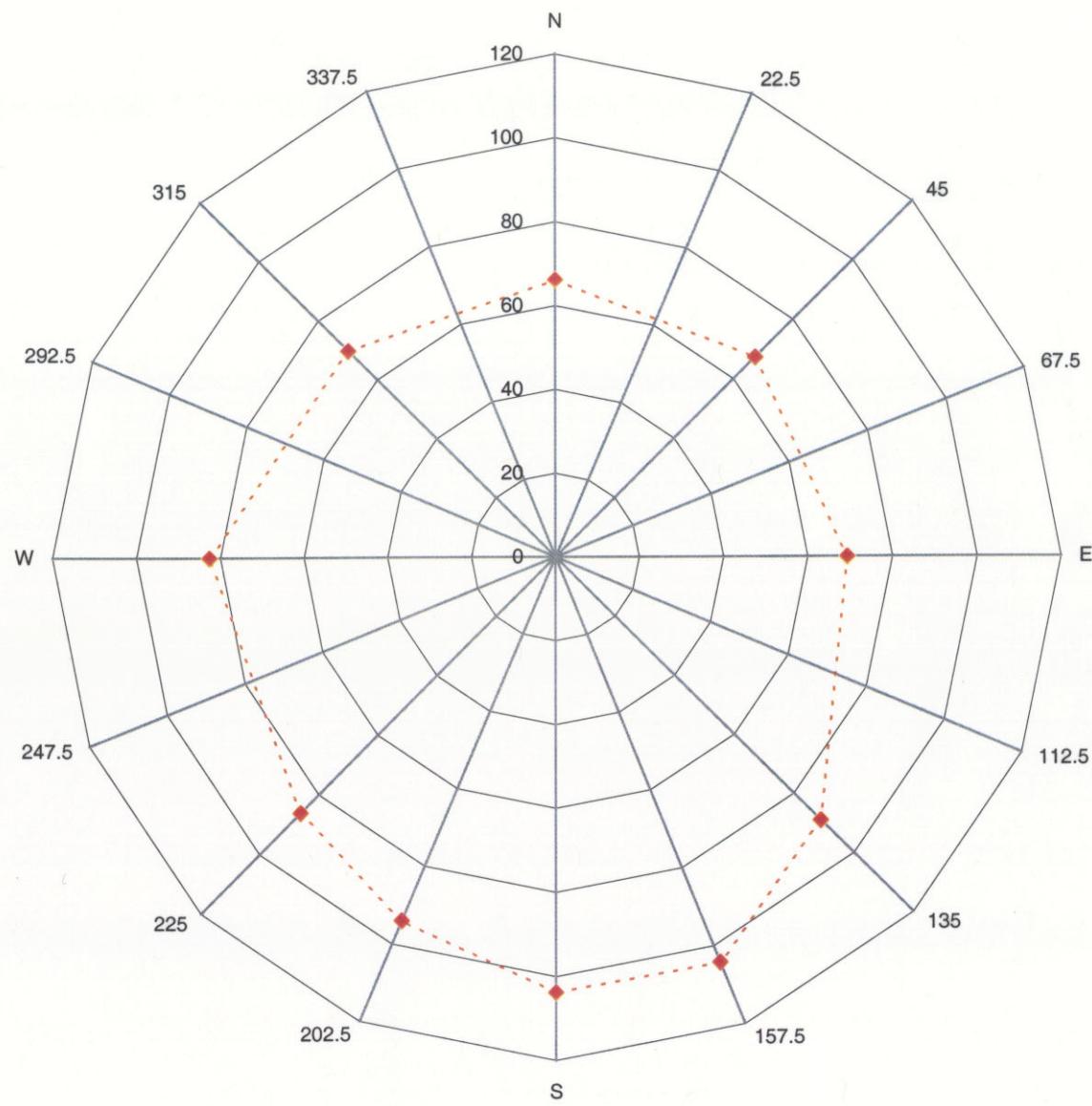




T3-EU-02

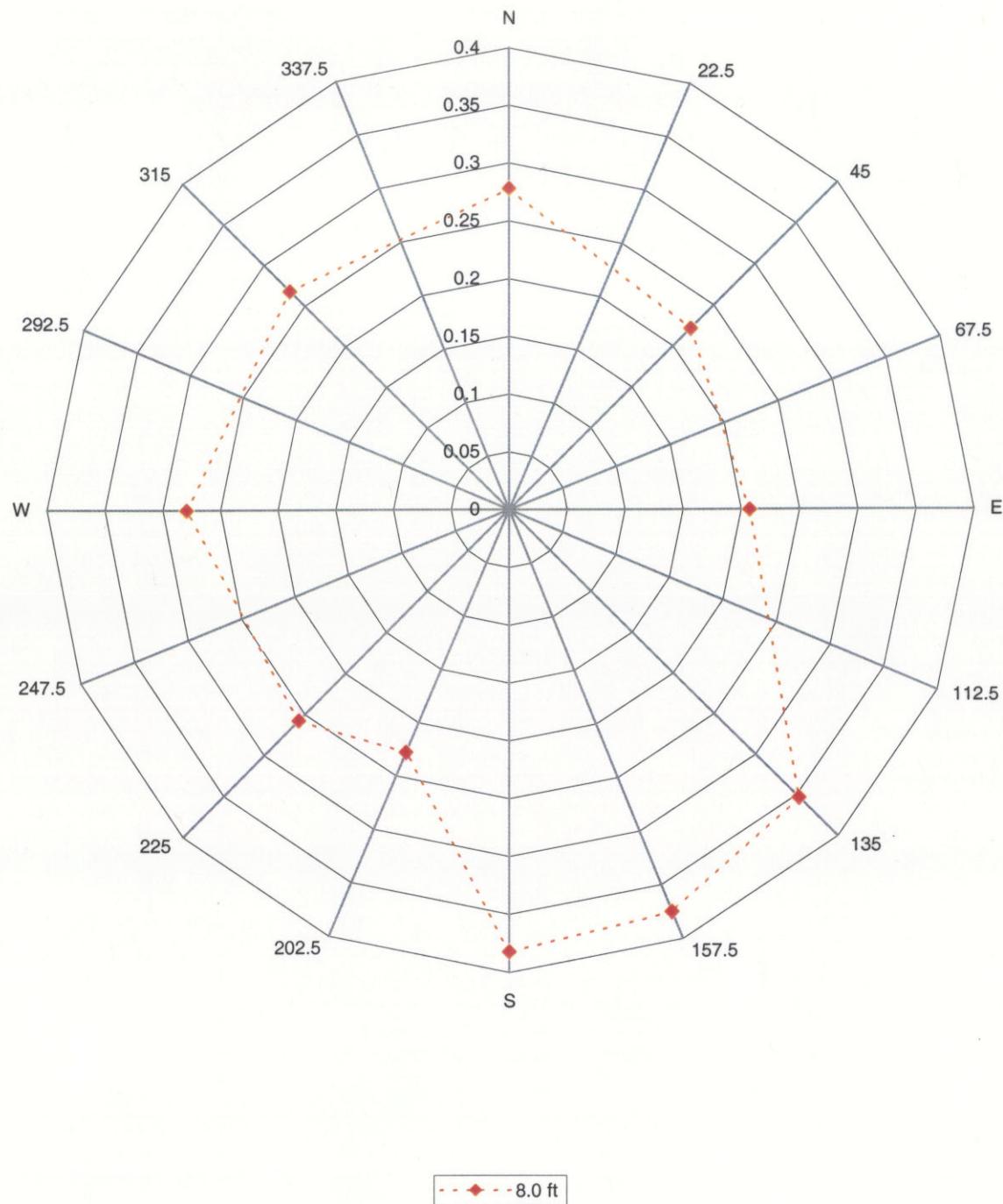


T3-EU-02 (Total Gamma)



-♦- 8.0 ft

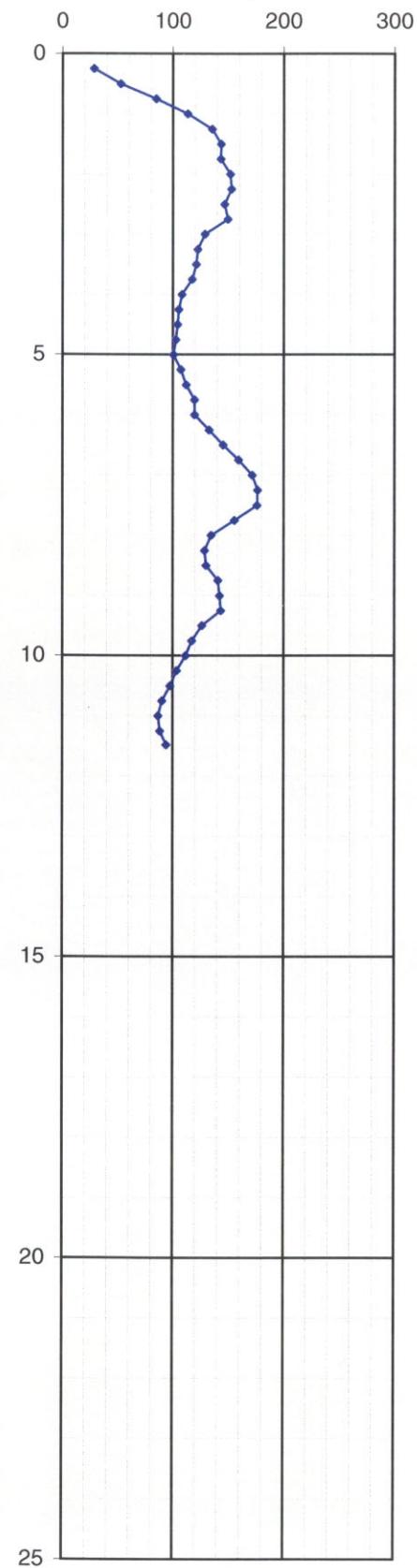
T3-EU-02 U-238p (1001 keV)



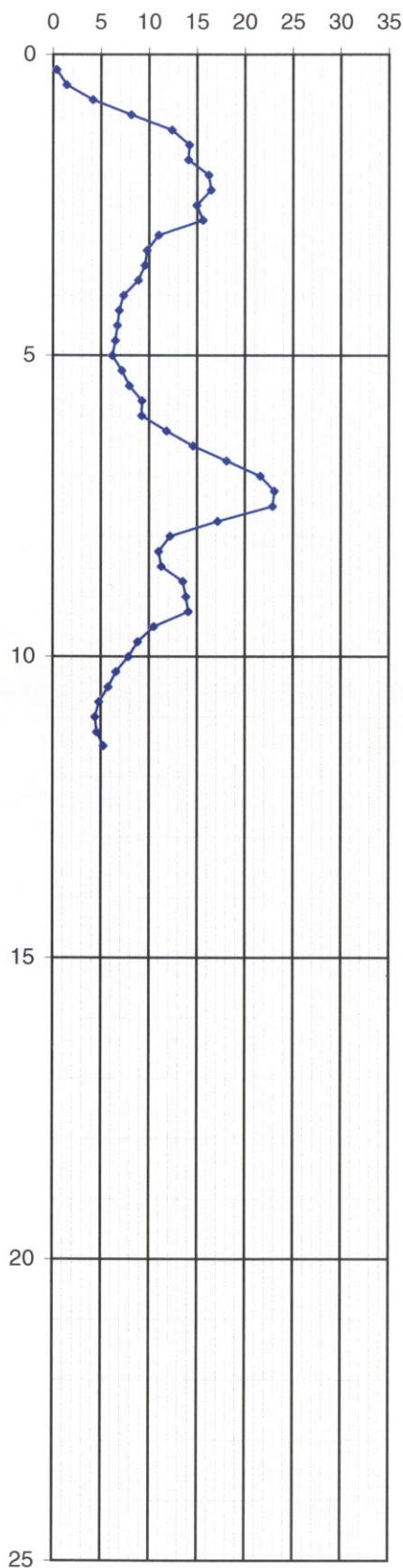
T3-EU-03

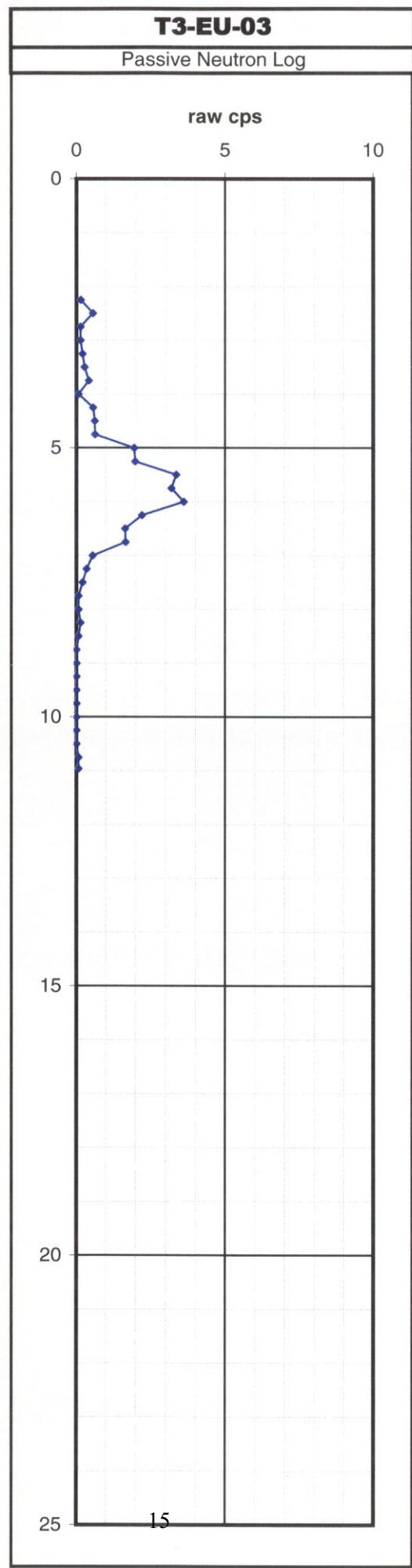
Neutron Log Response

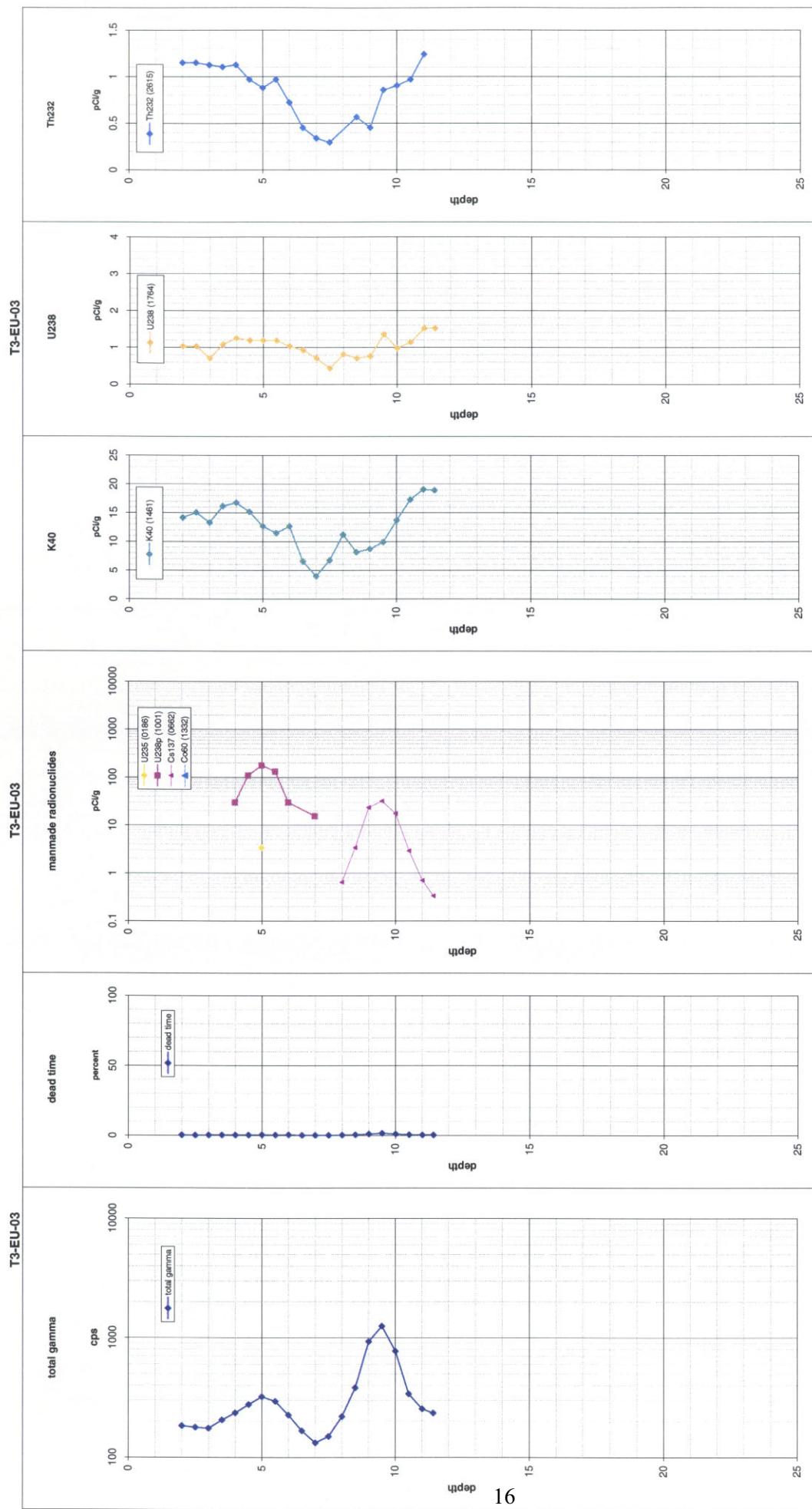
raw cps



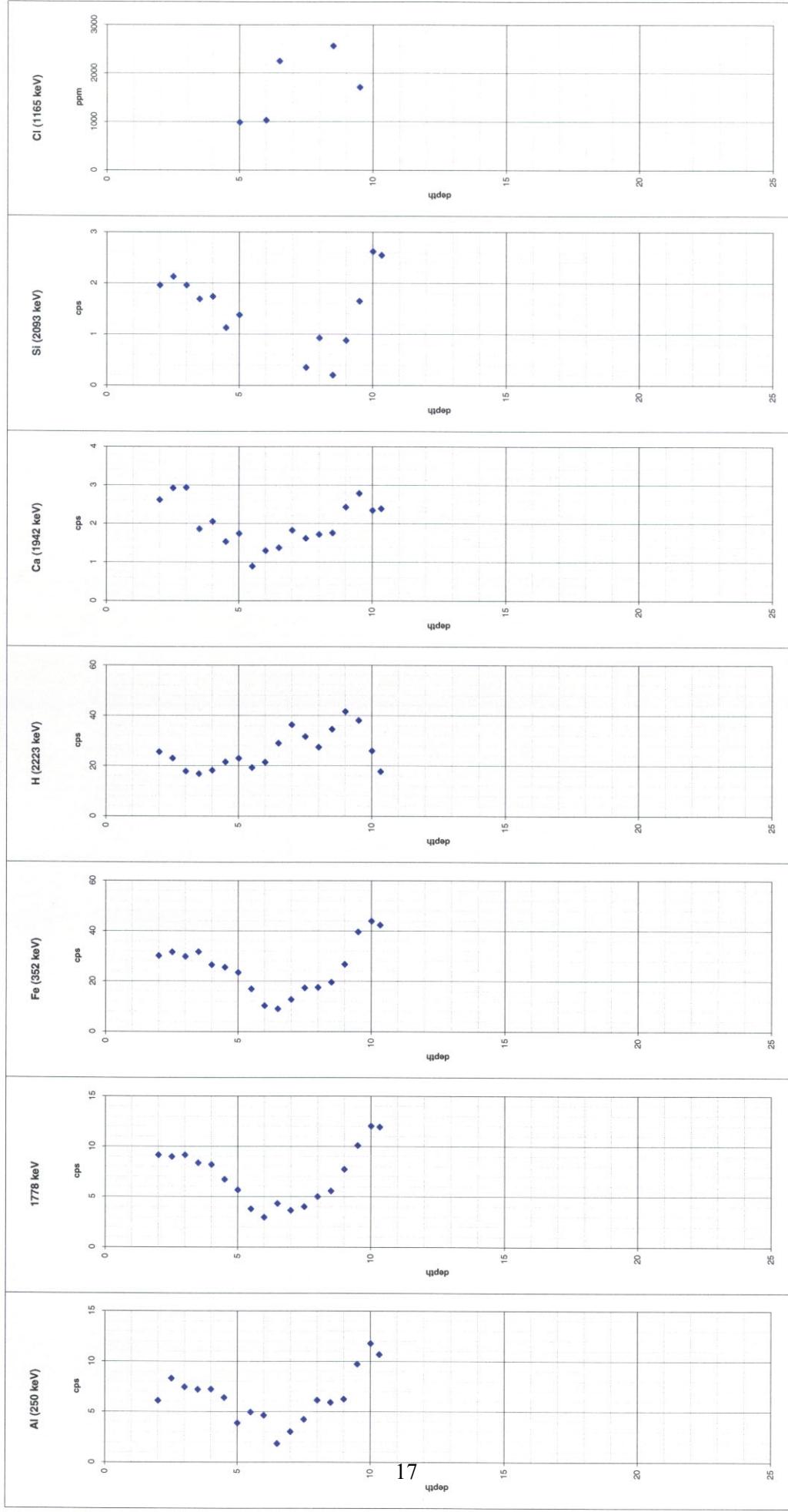
vol % moisture



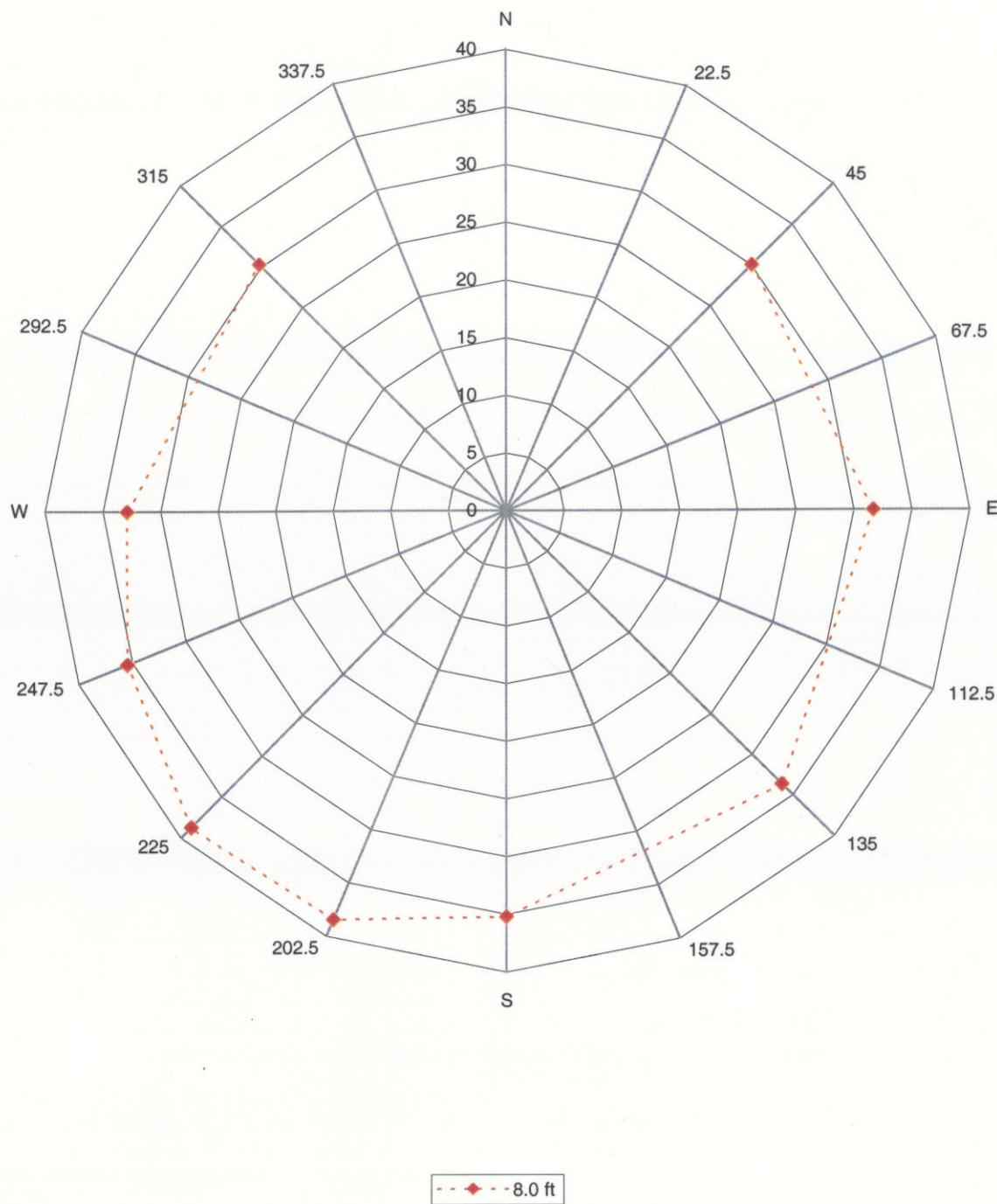




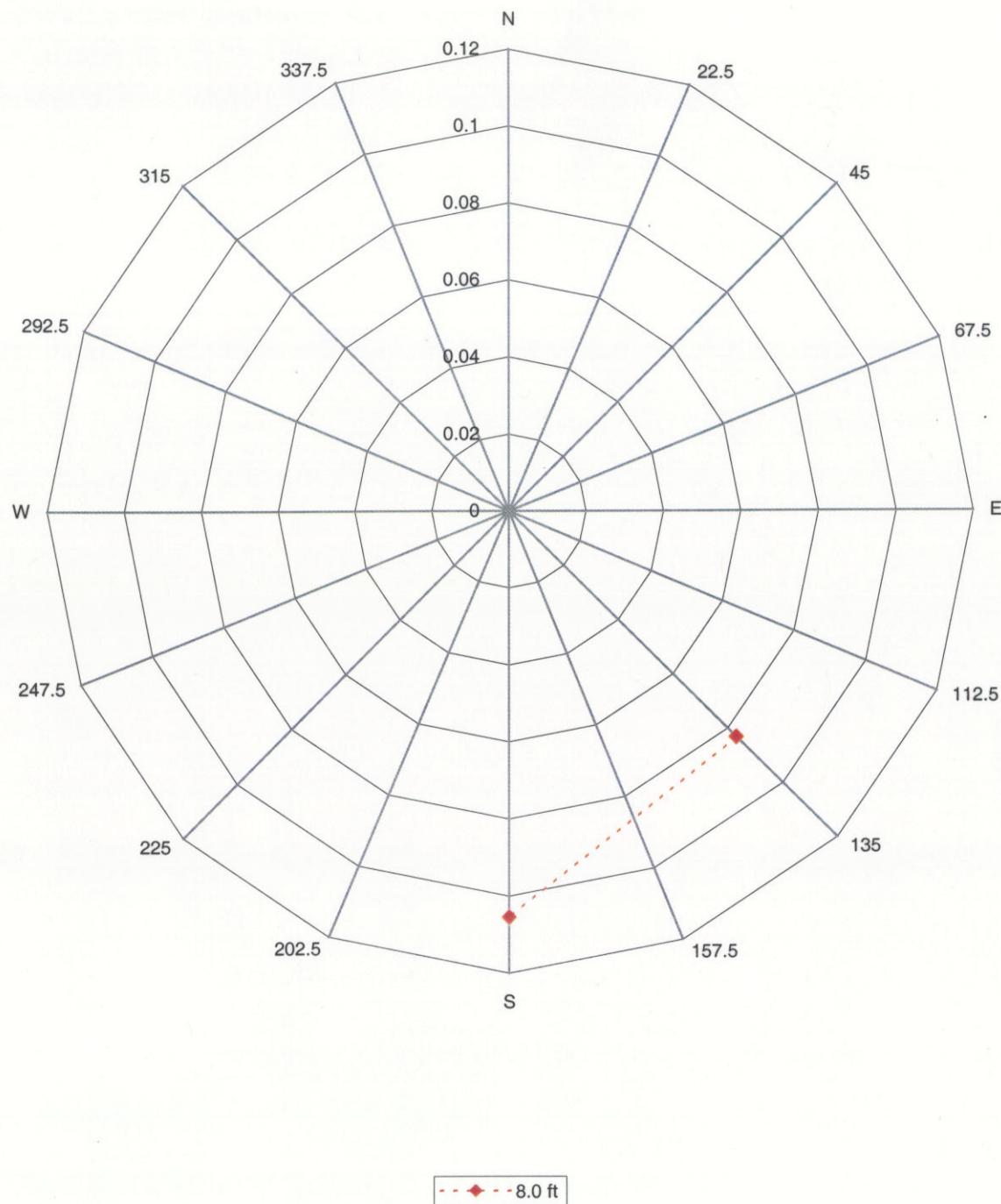
T3-EU-03



T3-EU-03 (Total Gamma)



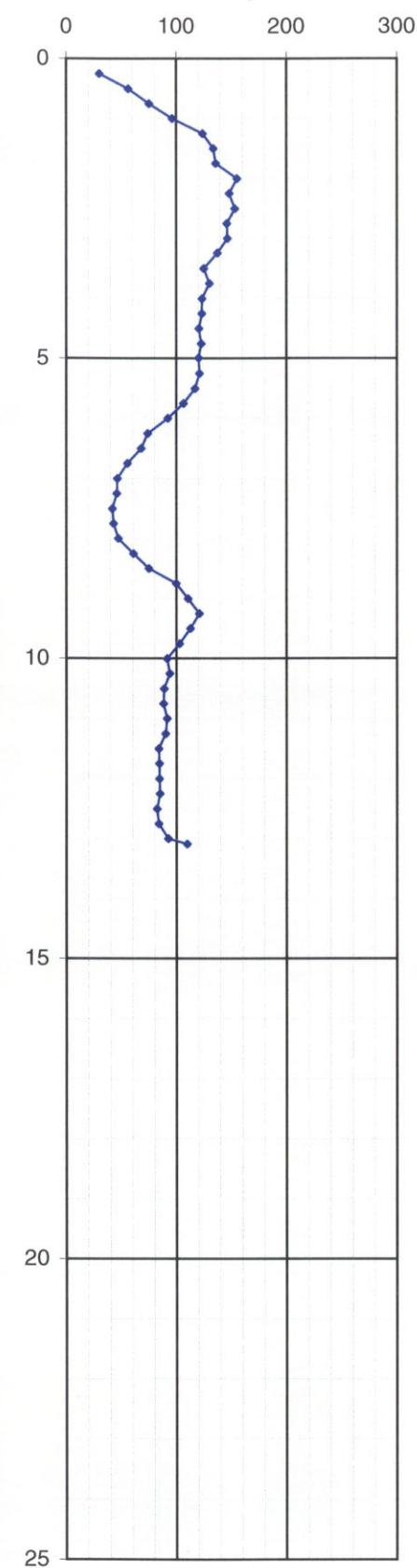
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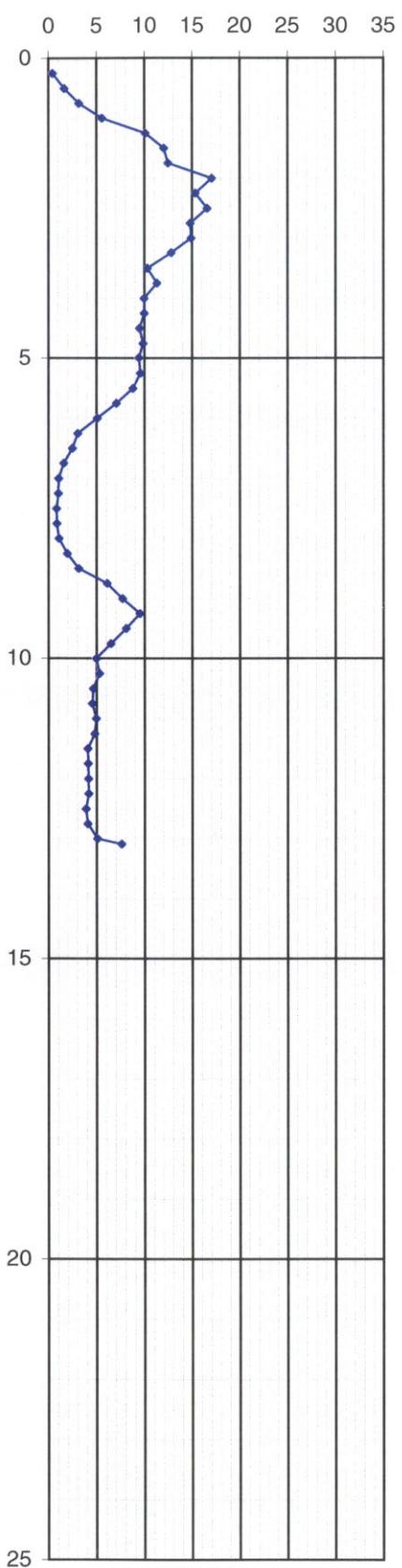
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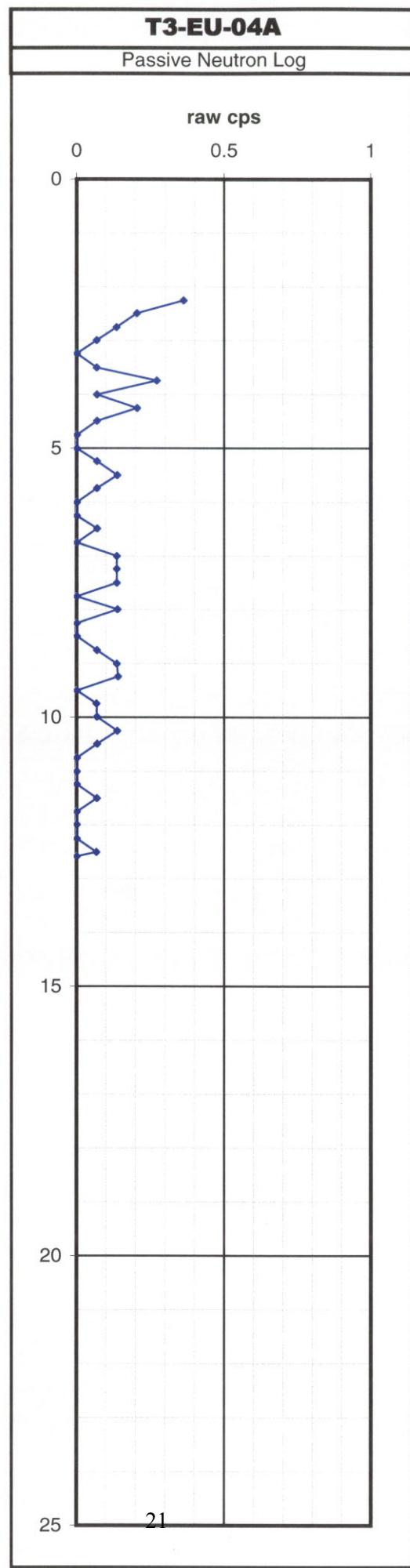
Neutron Log Response

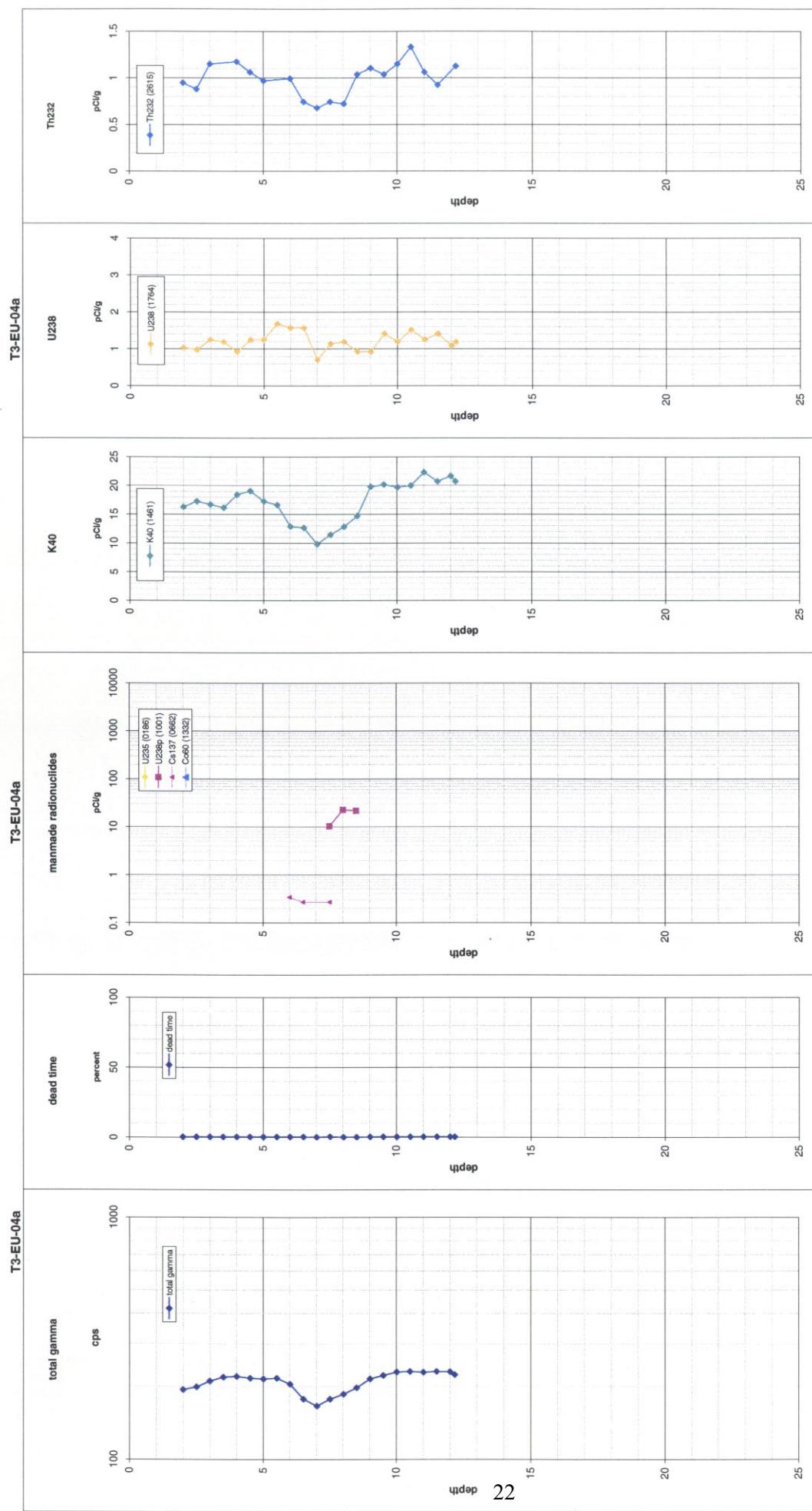
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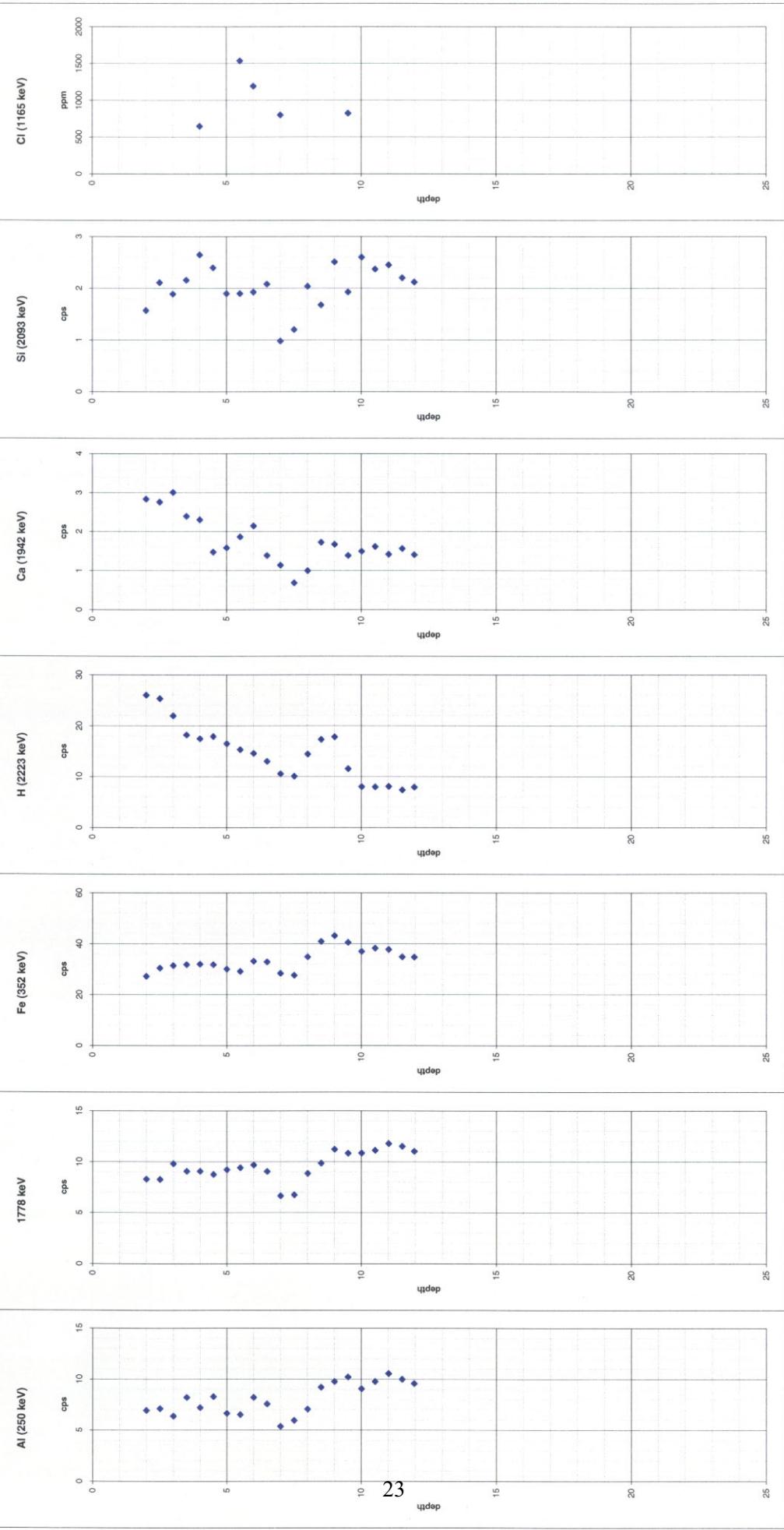
vol % moisture







T3-EU-04a



T47-IF-1

Neutron Log Response

raw cps

0 100 200 300



vol % moisture

0 5 10 15 20 25 30 35

